

## Tilburg University

### Carrying capacity of degrading environments

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a socio-economic module to evaluate optimal land use allocation and management requirements (including machinery, labour and fertiliser use) at the scale of individual (generic) farm enterprises;  
a hydrology module to evaluate runoff at the catchment scale.

The process of integration of the IMPEL modules requires the formal coupling of the different modelling approaches. This coupling needs to overcome several difficulties including:

- the need for different modelling approaches to operate at different temporal scales in view of the constraint of data availability and reliability;
- the need to operate at different spatial scales, e.g. land use decisions based on profitability are made at the scale of the farm enterprise, whereas biophysical soil and plant processes are described for individual fields or soil map units;
- the need to introduce feedbacks, e.g. farm-scale land use allocation models define optimum crop rotations based on (amongst other factors) crop productivity, but crop yields are themselves influenced by the preceding crop because of effects on available water and nutrients.

This paper seeks to discuss the difficulties arising from the integration of biophysical and socio-economic models, for land use studies, and to propose a methodology that attempts to overcome these difficulties. The paper is illustrated with examples from the UK.

#### **4.12 Carrying Capacity of Land and Humans in a Degrading Environment: The Case of the Sahel**

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Carrying capacity has strong multidisciplinary aspects; this study considers the combined perspectives of physical land degradation and psychology. The study was carried out among 2,442 pastoralists (Fulani) and agriculturalists (Mossi and Dogon) in the Sahel. Four

regions with different degrees, rates and states of degradation were examined using models to explore the interaction of both types of carrying capacity. Preliminary results reveal distinct relationships between biophysical stress and human adaptation.

Soil degradation is used as an indicator of pressure on the carrying capacity of land; the psychological indicators of carrying capacity used were stress and marginalisation. The central question in this research is the relationship of both types of indicators and how they are differentiated among the various ethnic and professional groups that are confronted with degrading land and acculturating social environments in the Sahel. Research was conducted in Mali (Bandiagara and Segue, both in the Pays de Dogon) and Burkina Faso (Kaya and Manga). Three sets of factors were hypothesized to influence stress and marginalisation, viz. (1) environmental degradation, (2) background variables such as gender and prosperity, and (3) using data sets of climatic change, surface soil degradation/sealing, erosion and nutrient depletion; psychological stress and marginalisation were gauged using cross-cultural standardised psychological instruments.

#### **4.13 Development of a Computerized Aid to Integrated Land Use Planning at regional level: a case study in the Mekong Delta, Vietnam.**

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Land use planning is an essential activity in any country. The greatest challenge in land use planning is how to incorporate the diversity in land use, including 'biodiversity' and 'sociodiversity', into the planning process. The objectives of this study are to develop and implement a method and corresponding software system for integrated land use planning at regional level in irrigated areas, and to test the method and the system in a case study.

A Computerized Aid to Integrated Land Use Planning, "CAILUP", was formulated. CAILUP focuses on integration in land use planning at different hierarchical levels, of bio-physical and socio-economic factors, of local expertise and global (international) expertise, and computer technology and land use planning. The CAILUP approach takes into account the diversity in land use by integrating promising land uses for agriculture, fisheries and forestry with land uses for other purposes.